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by Kellie Langlois and Didier Garriguet

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Abstract

According to the 2004 Canadian Community Health Survey—Nutrition, Canadians consumed an average of 110 grams (26 teaspoons) of sugar a day, approximately 20% of their total energy intake. While over 30% of this sugar came from vegetables and fruit, 35% came from the "other" foods category, which consists of items such as soft drinks, salad dressings and candy. The top ten sources of sugar accounted for approximately 85% of daily sugar intake. Beverages (milk, fruit juice, fruit drinks and regular soft drinks) represented 44% of the sugar consumed by children and adolescents, and 35% of that consumed by adults. Diabetics' average sugar intake was less than that of non-diabetics.

Keywords

Carbohydrates, caloric intake, diabetes, diet, energy intake, food

Authors

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One in every five calories that Canadians consume comes from sugar. This dietary sugar may occur naturally, for instance, in fruit and milk, or it may have been added to foods and beverages to improve palatability, for instance, in soft drinks, salad dressings, syrup and candy.

Although the body handles naturally occurring and added sugar in the same way, foods high in added sugar tend to have lower nutrient densities, and thus, provide little nutritional value. By contrast, foods with naturally occurring sugars tend to be higher in nutrients.[1]

Some debate surrounds the association between high sugar intake and adverse health effects, such as tooth decay, hyperactivity, and obesity.[2-4] No recommendations have been made about the intake of total sugar, nor does consensus exist about the consumption of added sugars. The Institute of Medicine recommends that no more than 25% of total daily energy intake (calories) come from added sugars. The World Health Organization recommends a daily maximum of 10% of calories from free sugars.[5]

This article describes dietary intake of sugar in a nationally representative sample of Canadian children and adults. Nutritional information was collected via a 24-hour dietary recall as part of the 2004 Canadian Community Health Survey (CCHS)—Nutrition. Respondents were asked to report everything they ate and drank during the previous 24 hours. The sugar content of these foods and beverages was determined using Health Canada's Canadian Nutrient File 2001b, Supplement[6] (see *The data*). This study reports daily intake of sugar by food group and by the top ten sources, but the data do not distinguish between naturally occurring and added sugars. As a result, it is not possible to assess where Canadians stand in relation to the Institute of Medicine and World Health Organization thresholds. The term "sugar" in this article represents the sum of naturally occurring and added sugars.

Average daily intake

On average, in 2004, Canadians consumed 110.0 grams of sugar a day, the equivalent of 26 teaspoons.[7] This amounted to 21.4% of their total daily caloric intake.

Absolute daily sugar consumption varied substantially with age (Figure 1). It was lowest among women aged 71 or older (83 grams or 20 teaspoons), and highest among teenage boys aged 14 to

18 (172 grams or 41 teaspoons). In every age group, males consumed significantly more sugar than did females.

The picture differs when the average percentage of daily calories coming from sugar is considered (Figure 2). From age 19 on, women derived a significantly higher percentage of their total calories from sugar than did men. The average ranged from a low of 19% among men aged 31 to 70 to 27% among children aged 1 to 3.

Food groups

To some extent, the sugar derived from the various food groups may be used as a proxy to distinguish between added versus naturally occurring sugars (Table 1). Sugar from vegetables and fruit and from milk products is more likely to be naturally occurring than is sugar that comes from the "other" foods category, which includes items such as soft drinks and candy that are high in added sugars.[1]

Overall, more than a third (35%) of the sugar that Canadians consumed came from the "other" foods category. The percentage peaked at 46% among teenage boys (Table 1). Regardless of

The data

The data are from the 2004 Canadian Community Health Survey (CCHS) – Nutrition, which collected information about the food and nutrient intake of the household population aged 0 or older. The 2004 CCHS excluded members of the regular Canadian Forces and residents of the three territories, Indian reserves, institutions and some remote areas, as well as all residents (military and civilian) of Canadian Forces bases. Detailed descriptions of the survey design, sample and interview procedures are available in a published report.[8]

This article is based on data from the "24-hour dietary recall" component of the 2004 CCHS. Respondents were asked to list all foods and beverages that they consumed during the 24 hours before the day of their interview (midnight to midnight). Interviewers used the "Automated Multiple Pass Method,"[9,10] with a five-step approach to help respondents remember what they had to eat and drink:

- quick list (respondents reported all foods and beverages consumed in whatever order they wished);
- questions about specific food categories and frequently forgotten foods;
- questions about the time of consumption and type of meal (for example, lunch, dinner);
- questions seeking more detailed, precise descriptions of foods and beverages and quantities consumed; and
- a final review.

A total of 35,107 people completed the initial 24-hour dietary recall, and a subsample of 10,786 completed a second recall three to ten days later, which aimed to assess day-to-day variations in intake. The response rates were 76.5% and 72.8%, respectively. This study uses data from the first recall only. Children younger than age 1 (n=289), respondents with "null" or invalid dietary recalls (n=62), pregnant (n=175) or breastfeeding (n=92) women, and children who were being breastfed (n=104) were excluded. Consequently, this analysis is based on 34,386 respondents aged 1 or older.

Information about children younger than age 6 was collected from their parents, and interviews for children aged 6 to 11 were conducted with parental help. Sugar intake was based on all foods and beverages reported (ingredients not recipes), the composition of which was calculated using Health Canada's Canadian Nutrient File (Supplement 2001b).[6] Approximately 4% of the food and recipe items were missing sugar information; missing values were set to zero when analyzed. More information on this derived variable can be found in the survey documentation.[11]

Respondents were asked about specific "long-term" health conditions that had lasted or were expected to last at least 6 months and had been diagnosed by a health professional. Those who replied "yes" to the question, "Do you have diabetes," were classified as diabetic.

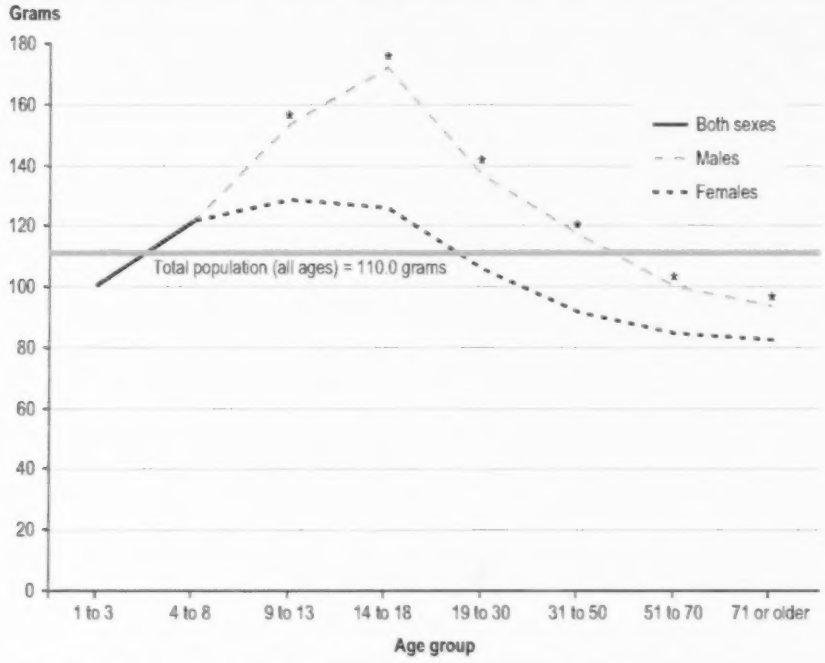
Food groups were categorized according to *Canada's Food Guide*: grain products, vegetables and fruit, meat and alternatives, milk products, and other.[12]

The top ten sources of sugar were examined. Milk included all forms of milk reported: whole, 2%, 1%, skim, evaporated, condensed, and other types of milk (soya, goat, whey, buttermilk). Fruit included citrus fruits (oranges, grapefruits, etc.), apples, bananas, cherries, grapes and raisins, melons (canteloup, honeydew, watermelon), peaches, nectarines, pears, pineapple, plums and prunes, strawberries, and other fruits (blueberries, dates, kiwis, fruit salads, dry fruit, etc.). Confectionary included candy, gum, popsicles, sherbert, jello, dessert toppings, pudding mixes, and chocolate bars. Cereals, grains and pasta included pasta, rice, cereal grains and flours, whole grain, oats, and high-fibre bread, and breakfast cereals (other). Vegetables included beans, broccoli, cabbage and kale, cauliflower, carrots, celery, corn, lettuce and leafy greens (spinach, mustard greens, etc.), mushrooms, onions, green onions, leeks, garlic, peas and snow peas, red and green peppers, squashes, tomatoes, tomato and vegetable juices, potatoes, and other vegetables (cucumber, immature beans, brussel sprouts, beets, turnips).

To account for the complex survey design, bootstrap weights were used to estimate standard errors, coefficients of variation, and confidence intervals.[13,14] T-tests were used to test differences between estimates. The significance level was set at $p < 0.05$.

This article has a number of limitations. The 2004 CCHS did not distinguish between added sugars and naturally occurring sugars. As well, sugar intake was self-reported, and so may be prone to recall bias or selective under-reporting. An earlier analysis[15] showed an almost 10% difference in total sugar intake among plausible respondents, compared with respondents who under-reported the calories they consumed. The data are seven years old (2004), but they are the most recent that are available on Canadians' sugar consumption. Data from the United States show a 10% decrease in sugar consumption from 2003/2004 to 2007/2008 among Americans.

Figure 1
Average daily sugar intake, by age group and sex, household population aged 1 or older, Canada excluding territories, 2004



* significantly different from estimate for females in same age group ($p<0.05$)
Source: 2004 Canadian Community Health Survey—Nutrition

among children and adolescents (25% versus 38%) and among adults (27% versus 40%) (data not shown).

Top ten sources

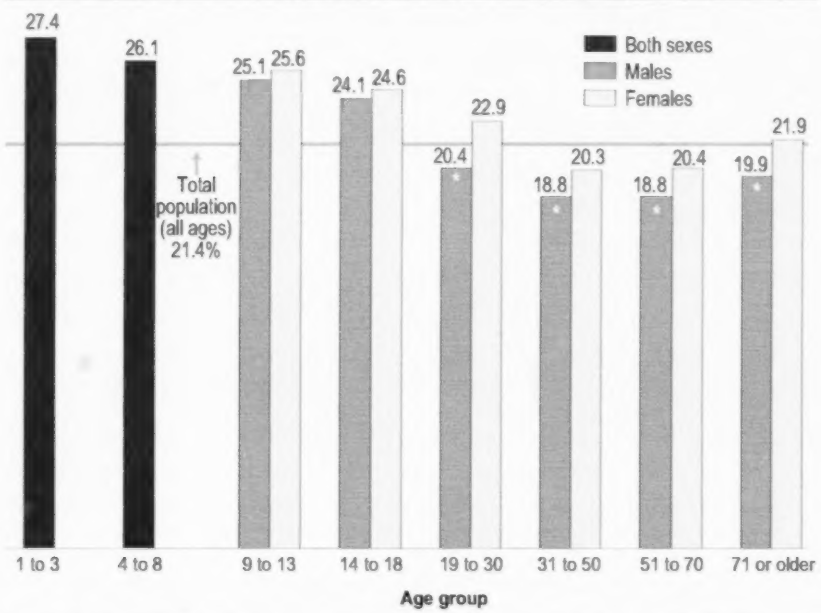
Ten sources accounted for approximately 85% of total sugar intake (Table 2). Almost half (44%) the average daily sugar intake of children and adolescents came from beverages, specifically milk (20% at ages 1 to 8; 14% at ages 9 to 18), fruit juice (15% and 9%), regular soft drinks (4% and 14%), and fruit drinks (6% and 7%). Milk was the primary source of sugar among children aged 1 to 8, but by ages 9 to 18, regular soft drinks ranked first. Beverages accounted for 35% of adults' daily sugar intake. Fruit also ranked high as a source of sugar: 15% for children and 17% for adults; apples and bananas were the most popular (data not shown). The percentage of sugar derived from confectionary items (for instance, chocolate bars, candies) was about twice as high for children (9%) and adolescents (10%) as for adults (5%).

age, males consumed more sugar from "other" foods than did females.

The percentage of total sugar intake that came from "other" foods rose from 17% at ages 1 to 3 to more than 40% at ages 14 to 18. However, among seniors aged 71 or older the percentage was 25%. The relatively low sugar intake of older adults (94 grams a day for men; 83 grams for women) was attributable to the decline in sugar from "other" foods associated with advancing age.

In fact, individuals who consumed the most sugar (above the 75th percentile in the distribution of consumption) derived more of it from the "other" foods category (and therefore, from added sugars) than from food groups that contain more naturally occurring sugars. Conversely, people who consumed the least sugar (in the 25th percentile of the distribution) got significantly less sugar from the "other" foods category than did individuals above the 75th percentile. This was true

Figure 2
Percentage of daily calories from sugar, by age group and sex, household population aged 1 or older, Canada excluding territories, 2004



* significantly different from estimate for females in same age group ($p<0.05$)
Source: 2004 Canadian Community Health Survey—Nutrition

Table 1
Percentage distribution of sources of sugar intake, by food group, age group and sex, household population aged 1 or older, Canada excluding territories, 2004

	Grain products			Vegetables and fruit			Meat and alternatives			Milk products			Other foods		
		95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval	
Age group and sex	%	from	to	%	from	to	%	from	to	%	from	to	%	from	to
Total	**14.2**	**13.8**	**14.6**	**31.1**	**30.5**	**31.6**	**1.3**	**1.2**	**1.3**	**17.7**	**17.3**	**18.1**	**34.7**	**34.0**	**35.4**
1 to 3	11.4	10.4	12.3	38.0	36.5	39.6	0.9	0.8	1.0	31.0	29.6	32.4	16.5	14.7	18.4
4 to 8	15.8	15.0	16.6	29.9	28.6	31.2	1.0	0.9	1.2	24.5	23.5	25.6	27.0	25.6	28.4
9 to 13															
Boys	15.9	14.7	17.0	22.8*	21.1	24.5	1.0	0.9	1.2	21.5	20.0	23.0	37.5*	35.2	39.9
Girls	14.9	13.8	16.0	27.9	26.1	29.6	0.8	0.7	1.0	20.8	19.5	22.0	34.4	32.5	36.4
14 to 18															
Boys	13.8	12.7	15.0	20.0*	18.4	21.6	1.0	0.8	1.1	18.7	17.3	20.1	45.8*	43.5	48.0
Girls	12.8	11.4	14.1	24.6	22.9	26.3	0.9	0.7	1.0	18.7	17.2	20.3	41.8	39.7	43.9
19 to 30															
Men	12.8	11.5	14.1	25.7*	23.5	27.8	1.5*	1.3	1.8	15.5	13.9	17.1	43.2*	40.8	45.5
Women	12.5	11.1	13.9	30.4	28.0	32.9	1.2	0.9	1.4	16.8	15.4	18.2	37.8	35.1	40.5
31 to 50															
Men	14.4	13.1	15.6	29.5*	27.5	31.5	1.4	1.1	1.6	14.2*	12.9	15.4	39.8*	37.5	42.1
Women	13.4	12.0	14.7	33.2	31.2	35.2	1.3	1.1	1.5	17.8	16.5	19.1	33.6	31.1	36.0
51 to 70															
Men	15.0	13.8	16.3	37.3	35.0	39.7	1.6	1.4	1.8	14.8*	13.6	16.1	30.5*	28.6	32.4
Women	15.0	13.9	16.1	39.1	37.5	40.7	1.5	1.4	1.7	17.1	16.0	18.2	26.5	24.8	28.3
71 or older															
Men	17.6	15.6	19.6	37.6*	35.7	39.4	1.6*	1.3	1.9	17.7	15.4	20.0	24.8*	22.7	26.8
Women	16.1	14.9	17.2	42.4	40.7	44.2	1.1	0.9	1.3	18.2	17.0	19.3	21.4	20.0	22.9

* significantly different from estimate for females in same age group ($p<0.05$)
Source: 2004 Canadian Community Health Survey—Nutrition

Table 2
Top ten sources of sugar intake, by age group, household population aged 1 or older, Canada excluding territories, 2004

Ages 1 to 8		Ages 9 to 18		Age 19 or older	
	% of total sugar intake		% of total sugar intake		% of total sugar intake
Milk	19.9	Soft drinks - regular	14.3	Fruit	17.4
Fruit	14.9	Milk	14.0	Soft drinks - regular	13.0
Fruit juice	14.6	Fruit	10.6	Sugars (white and brown)	11.4
Confectionary	8.7	Confectionary	10.3	Milk	10.7
Fruit drinks	6.2	Fruit juice	9.1	Fruit juice	7.6
Sugars (white and brown)	5.4	Fruit drinks	7.4	Vegetables	6.8
Other sugars (syrups, molasses, honey, etc)	5.3	Sugars (white and brown)	6.3	Confectionary	5.3
Cereals, grains and pasta	4.3	Other sugars (syrups, molasses, honey, etc)	5.4	Other sugars (syrups, molasses, honey, etc)	4.5
Soft drinks - regular	3.6	Cereals, grains and pasta	4.5	Fruit drinks	3.7
Vegetables	2.9	Vegetables	3.3	Cereals, grains and pasta	3.3

Source: 2004 Canadian Community Health Survey—Nutrition.

Diabetes

As part of their treatment, diabetics are advised to eat a well-balanced diet and limit their added sugar intake to less than 10% of daily calories.[16] Results of the 2004 CCHS indicate that diabetics consume significantly less total sugar than do non-diabetics: 73.4 versus 111.5 grams a day (Table 3). As a percentage of daily calories, sugar consumption among diabetics answering the survey averaged 17%. This was significantly lower than non-diabetics' daily average of 21.5% of calories. As well, compared with people who did not have diagnosed diabetes, diabetics derived a larger percentage of the sugar they consumed from vegetables and fruit (40% versus 31%), milk (20% versus 18%) and grains (16% versus

Table 3
Average daily sugar intake and percentage distribution of sources of sugar, by diabetes status, household population aged 1 or older, Canada excluding territories, 2004

	Diabetes			Without diabetes		
		95% confidence interval			95% confidence interval	
	Estimate	from	to	Estimate	from	to
Average total sugar intake (grams)	**73.4***	**69.4**	**77.4**	**111.5**	**109.9**	**113.1**
% of calories	**17.0***	**16.2**	**17.8**	**21.5**	**21.3**	**21.8**
Distribution by food group	%			%		
Grain products	16.0*	14.4	17.5	14.2	13.8	14.6
Vegetables and fruit	40.2*	37.6	42.8	30.8	30.5	31.4
Meat and alternatives	1.9*	1.6	2.3	1.3	1.2	1.3
Milk products	20.0*	18.3	21.7	17.7	17.4	18.1
Other foods	21.1*	18.5	23.7	35.1	33.9	35.8

* significantly different from estimate for those without diabetes ($p<0.05$)
Source: 2004 Canadian Community Health Survey—Nutrition.

14%), and a much lower percentage from the "other" foods category (21% versus 35%).

Conclusion

The sugar that Canadians consume accounts for 21% of their daily calories. While 31% of this sugar comes from vegetables and fruit, a higher percentage—35%—comes from "other" foods. Beverages are among the top sources of sugar. Diabetics consume significantly less sugar than do non-diabetics. ■

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